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Remarks

This application has been reviewed in light of the Office Action of August 24, 2007. Claims 1-21 are pending and all claims are rejected. In response, the following remarks are submitted. Reconsideration of this application is requested.

Ground 1. Claims 1-15 and 21 are rejected under 35 USC 103 over Glenn U.S. Patent 6,313,396 in view of Vilela U.S. Patent 5,800,630. Applicant traverses this ground of rejection.

The following principle of law applies to all §103 rejections. MPEP 2143.03 provides "To establish prima facie obviousness of a claimed invention, all claim limitations must be taught or suggested by the prior art. In re Royka, 490 F.2d 981, 180 USPQ 580 (CCPA 1974). All words in a claim must be considered in judging the patentability of that claim against the prior art. In re Wilson, 424 F.2d 1382, 1385, 165 USPQ 494, 496 (CCPA 1970)." [emphasis added] That is, to have any expectation of rejecting the claims over a single reference or a combination of references, each limitation must be taught somewhere in the applied prior art. If limitations are not found in any of the applied prior art, the rejection cannot stand. In this case, the applied prior art references clearly do not arguably teach some limitations of the claims.

This analysis is conducted mindful of the legal standard for a §103 rejection. Graham v. John Deere, 148 USPQ 459 (Sup. Ct., 1966) requires the following steps: (1) determine the scope and content of the prior art; (2) ascertain the differences between the prior art and the claims at issue; and (3) assess the level of skill in the art. Obviousness is determined against this background.

In determining obviousness, MPEP 706.02(j) requires (a) a statement of the relevant teachings of the prior art relied upon, preferably with reference to the relevant column or page number(s) and line number(s) where appropriate, (b) a statement of the differences in the claim over the applied references; (c) the proposed modifications to the art reference to arrive at the claimed subject matter; and (d) an explanation why one of ordinary skill in the art at the time the invention was made would have been motivated to make the proposed modification.

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Claim 1 recites in part:

"a heat sink"

Glenn does not teach a heat sink. The explanation of the rejection identifies element 20 of Glenn as a heat sink. Substrate 20 is in fact a substrate that is made of a dielectric (i.e., nonconducting) material, and is preferably a material such as Kapton film or glass fibers (col. 6, lines 31-44). Substrate 20 of Glenn cannot perform as a heat sink.

The Response to Arguments expresses a misunderstanding of the function of the recited heat sink. Heat sinks are good conductors of heat and accelerate the dissipation of heat as compared to a structure where there is no heat sink. Electrical nonconductors such as Kapton also are not good conductors of heat, do not conduct heat to any appreciable degree, and in fact are good thermal insulators as well as electrical insulators. Had claim 1 recited an "insulator layer" rather than a "heat sink," then the substrate 20 of Glenn might provide the required teaching. However, as understood, it does not.

The Response to Arguments asserts "as long as substrate 20 has one surface area for absorbing heat and other surface areas for dissipating heat, the Examiner believes that substrate 20 can perform as a heat sink." Applicant must respectfully disagree for several reasons.

First, this statement suggests that there is no such thing as solid insulation, because all solid insulation will also have one surface for absorbing heat and another surface for dissipating heat. The proper line of analysis is not geometry, but instead is whether the thermal conductivity of the heat-sink material is high so that it accelerates heat conduction, or low, so that it inhibits heat conduction. A material with high heat conductivity can be used as a heat sink, while a material with low heat conductivity can be used as an insulator. Glass and Kapton, as taught by Glenn, are of low thermal conductivity and are therefore insulators.

Second, those skilled in the art recognize both glass fibers and Kapton as insulators. Applicant submits herewith several evidentiary exhibits on the point.

Exhibit 1 is part of The History of Spacesuits. As discussed in the very last sentence, speaking of the boots worn by those walking on the moon, who certainly did not want cold feet,

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“The boot inner layers were made from Teflon-coated glass-fiber cloth followed by 25 alternating layers of Kapton film and glass-fiber cloth to form an efficient, lightweight thermal insulation.”

Both of the materials referenced by Glenn for use as the substrate 20 are identified as insulators.

Exhibit 2 is an excerpt from U.S. Patent 6,993,927, which at col. 4, line - col. 5, line 25 discusses thermal insulation, specifically mentioning Kapton as a good material for use in thermal insulator.

Exhibit 3 is a printout from the website of Dass & Company, which discusses as one of its product Thermal Insulation Material, specifically Kapton.

The Owens Corning website describes Owens Corning as the inventor of glass fiber insulation (emphasis added), including PINK insulation products.

The technical world recognizes Kapton and glass fiber as insulators, not heat sink material. One uses Kapton and glass fibers if one wants to inhibit heat flow and heat loss, not accelerate it as in a heat sink.

Glenn does not disclose the limitations of claim 1.

Claims 2-10 and 21 depend from claim 1 and are therefore also allowable.

Additionally, claims 2-5 recite relationships involving “projected area coverage.” Neither reference discusses or teaches “projected area coverage” or any related concept. In each case, the explanation of the rejection references Figure 1 of Glenn. Figure 1 is a side cross-sectional view. One cannot tell anything about projected areas from such a side cross-sectional view. The side cross-sectional view does not show the spatial extent of features in the third direction.

Claim 9 recites, “the solar cell structure includes a joint between the intermediate structure and the heat sink, and wherein the joint comprises a metallic trace deposited upon a dielectric layer.” The explanation of the rejection asserts that the elements 17 and 19 constitute the recited metallic trace, and that the bonding element 18 constitutes the dielectric layer. The explanation of the rejection references Figure 1 and col. 5, lines 24-26 of Glenn. Neither of these locations suggests that the metal trace 19 and the conducting element 17 are deposited upon the dielectric 18.

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Claim 10 recites "the joint comprises a PC board having a metal trace on a face thereof." The explanation of the rejection references Figure 1, and the same elements 17, 18, and 19 are discussed in relation to claim 9. There is no teaching that any of these elements is a PC (printed circuit) board. The explanation of the rejection asserts that "the structure of the joint is indistinguishable to a PC board having a metal trace on a face..." Applicant must respectfully disagree. A PC board is a specific structure. If the rejection is maintained, the Examiner must establish by evidence that the structure taught by Glenn is "indistinguishable" from a PC board.

Amended claim 11 also recites the "heat sink" and "projected area" limitations. The references do not disclose these limitations for the reasons discussed above in relation to claims 1-5.

Claims 11-15 depend from claim 11 and are therefore also allowable.

Additionally, regarding claims 14-15, see the prior discussion of claims 9-10.

Ground 2. Claims 1, 5-8, and 21 are rejected under 35 USC 103 over Hartman U.S. Patent 4,577,051 in view of Vilela U.S. Patent 5,800,630. Applicant traverses this ground of rejection.

MPEP 2142, under ESTABLISHING A PRIMA FACIE CASE OF OBVIOUSNESS, provides: "To establish a prima facie case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine the reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on applicant's disclosure. [citations omitted]. See MPEP para 2143-2143.03 for decisions pertinent to each of these criteria."

First requirement--there must be an objective basis for modifying or combining the teachings of the references.

The first of the requirements of MPEP 2142 is that "there must be some suggestion or motivation, either in the references themselves or in the knowledge

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generally available to one of ordinary skill in the art, to modify the reference or to combine the reference teachings." The present rejection is a §103 combination rejection. To reach a proper teaching of an article or process through a combination of references, there must be stated an objective motivation to combine the teachings of the references, not a hindsight rationalization in light of the disclosure of the specification being examined. MPEP 2142, 2143 and 2143.01. *See also*, for example, In re Fine, 5 USPQ2d 1596, 1598 (at headnote 1) (Fed.Cir. 1988), In re Laskowski, 10 USPQ2d 1397, 1398 (Fed.Cir. 1989), W.L. Gore & Associates v. Garlock, Inc., 220 USPQ 303, 311-313 (Fed. Cir., 1983), and Ex parte Levengood, 28 USPQ2d 1300 (Board of Appeals and Interferences, 1993); Ex parte Chicago Rawhide Manufacturing Co., 223 USPQ 351 (Board of Appeals 1984). As stated in In re Fine at 5 USPQ2d 1598:

"The PTO has the burden under §103 to establish a prima facie case of obviousness. [citation omitted] It can satisfy this burden only by showing some objective teaching in the prior art or that knowledge generally available to one of ordinary skill in the art would lead that individual to combine the relevant teachings of the references."

And, at 5 USPQ2d 1600:

"One cannot use hindsight reconstruction to pick and choose among isolated disclosures in the prior art to deprecate the claimed invention."

Following this authority, the MPEP states that the examiner must provide such an objective basis for combining the teachings of the applied prior art. In constructing such rejections, MPEP 2143.01 provides specific instructions as to what must be shown in order to extract specific teachings from the individual references:

"Obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention when there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. In re Fine, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988); In re Jones, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992)."

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"The mere fact that references can be combined or modified does not render the resultant combination obvious unless the prior art also suggests the desirability of the combination." In re Mills, 916 F.2d 680, 16 USPQ2d 1430 (Fed. Cir. 1990)."

"A statement that modifications of the prior art to meet the claimed invention would have been 'well within the ordinary skill of the art at the time the claimed invention was made' because the references relied upon teach that all aspects of the claimed invention were individually known in the art is not sufficient to establish a prima facie case of obviousness without some objective reason to combine the teachings of the references. Ex parte Levengood, 28 USPQ2d 1300 (Bd. Pat. App. & Inter. 1993)."

Here, there is set forth no objective basis for combining the teachings of the references in the manner used by this rejection, and selecting the helpful portions from each reference while ignoring the unhelpful portions. An objective basis is one set forth in the art or which can be established by a declaration, not one that can be developed in light of the present disclosure.

In this case, it is argued that the teaching of Vilela is to be combined with that of Hartman because "it would give a low resistance back contact." (Final Office Action, page 8, lines 15-19.) There is no reason to believe that Hartman's depicted structure does not already provide a "low resistance back contact." Hartman presumably provides a fully operational solar cell. It is additionally argued that the basis for the combination of teachings is "conventional use." This is a variation of a "well known" argument. "Well known" and "commonly known" are not classes of statutory prior art recognized in 35 USC 102 or 35 USC 103. Applicant traverses this substitution of asserted "well known" prior art for a statutory prior art reference as applied in the context of the claim. Here, the matters asserted to be "well known" are not, in this context. Applicant requests that, if the rejection is maintained, the Examiner apply a statutory prior art reference and set forth a rejection that incorporates the statutory prior art, to the extent that it is different from Vilela. MPEP 2144.03. If the asserted limitations are in fact well known, it should present no obstacle for the Examiner to cite and apply an appropriate statutory prior art reference. Absent such an application of

statutory prior art in the statement of the rejection, Applicant requests that the rejection be withdrawn.

If the rejection is maintained, Applicant asks that the Examiner set forth the objective basis found in the references themselves for combining the teachings of the references, and for adopting only the helpful teachings of each reference and disregarding the unhelpful teachings of the reference. Thus, as it stands now, the invention as a whole is not prima facie obvious over the combined teachings of the prior art.

Second requirement--there must be an expectation of success.

The second of the requirements of MPEP 2142 is an expectation of success. There is no expectation of success...This requirement has not been addressed in the explanation of the rejection, and in any event more than Examiner's argument is required here. The proposed modification cannot render the reference inoperable or unsatisfactory for its intended purpose, MPEP 2142, 2143.01, and MPEP 2143.02.

As stated in MPEP 2142, "The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on applicant's disclosure. [citations omitted]."

This requirement is not addressed in the explanation of the rejection.

Third requirement--the prior art must teach the claim limitations.

The third of the requirements of MPEP 2142 is that "the prior art reference (or references when combined) must teach or suggest all the claim limitations." In this regard, the following principle of law applies to all §103 rejections. MPEP 2143.03 provides "To establish prima facie obviousness of a claimed invention, all claim limitations must be taught or suggested by the prior art. In re Royka, 490 F2d 981, 180 USPQ 580 (CCPA 1974). All words in a claim must be considered in judging the patentability of that claim against the prior art. In re Wilson, 424 F.2d 1382, 1385, 165 USPQ 494, 496 (CCPA 1970)." [emphasis added] That is, to have any expectation of rejecting the claims over a single reference or a combination of references, each limitation must be taught somewhere in the applied prior art. If limitations are not found in any of the applied prior art, the rejection cannot stand. In this case, the applied prior art references clearly do not arguably teach some limitations of the claims.

This analysis is conducted mindful of the legal standard for a §103 rejection. Graham v. John Deere, 148 USPQ 459 (Sup. Ct., 1966) requires the following steps: (1) determine the scope and content of the prior art; (2) ascertain the differences between the prior art and the claims at issue; and (3) assess the level of skill in the art. Obviousness is determined against this background.

In determining obviousness, MPEP 706.02(j) requires (a) a statement of the relevant teachings of the prior art relied upon, preferably with reference to the relevant column or page number(s) and line number(s) where appropriate, (b) a statement of the differences in the claim over the applied references; (c) the proposed modifications to the art reference to arrive at the claimed subject matter; and (d) an explanation why one of ordinary skill in the art at the time the invention was made would have been motivated to make the proposed modification.

Claim 1 recites in part:

“a heat sink”

Hartman does not teach a heat sink. The explanation of the rejection identifies element 22 of Hartman as a heat sink. Element 22 of Hartman is in fact a piece of “non-conductive reinforcing tape 22” such as “an adhesive backed polymer tape.” The reinforcing tape 22 does not perform as a heat sink.

Heat sinks are good conductors of heat and accelerate the dissipation of heat as compared to a structure where there is no heat sink. Nonconductors such as reinforcing tape 22 do not conduct heat to any appreciable degree, and in fact are good insulators. Had claim 1 recited an “insulator layer” rather than a “heat sink,” then the reinforcing tape 22 of Harman might provide the required teaching.

As discussed in relation to the Ground 1 rejection, nonconducting materials are not good heat sinks.

Vilela has no relevant teaching.

The combination of the two references therefore cannot teach the limitations of claim 1.

Claims 5-8 and 21 depend from claim 1 and incorporate its limitations. They are therefore allowable over this rejection.

Additionally, claim 5 recites in part: “the intermediate-structure projected area coverage on the heat sink is not less than the solar-cell projected area coverage on the

heat sink.” The explanation of the rejection relies on Figures 1-2 of Hartman. Figures 1-2 of Hartman do not even show the relevant features in the pertinent view. The plan view of Figure 1 does not show the solar cell 16 at all. As discussed in relation to the Ground 1 rejection of claim 1, one cannot tell about the projected area from a side view such as Figure 2 of Hartman, because it does not show the third dimension. In fact, one must look to Figure 3 of Hartman to see the relative projected areas. As shown in Figure 3, the projected area of the solar cells is much, much larger than the projected areas of the intermediate structure as identified by the Examiner.

Claim 6 recites in part: “an intra-unit electrical connection structure operable to electrically interconnect the solar cell and the by-pass diode in an electrical anti-parallel relation.” Hartman has no such teaching of an “anti-parallel” interconnection at col. 4, lines 43-58 or elsewhere.

Claim 8 recites in part: “a circuit electrical connection structure operable to electrically interconnect each of the solar cell unit structures in series.” Although col. 5 lines 25-27 of Hartman state that twelve solar cells 16 were connected in series, there is no teaching of how that series connection was accomplished. Figures 1-3 certainly do not depict a series connection of the solar cells.

Ground 3. Claims 16-18 are rejected under 35 USC 103 over Hartman '051 in view of Vilela '630. Applicant traverses this ground of rejection.

First requirement--there must be an objective basis for modifying or combining the teachings of the references.

Applicant incorporates the discussion of this requirement from the discussion of the Ground 2 rejection.

Second requirement--there must be an expectation of success.

Applicant incorporates the discussion of this requirement from the discussion of the Ground 2 rejection.

This requirement is not addressed at all in the explanation of the rejection.

Third requirement--the prior art must teach the claim limitations.

Claim 16 recites in part: "a heat sink." Neither reference teaches a heat sink for the reasons stated earlier in relation to the Ground 2 rejection.

Claim 16 further recites in part: "the solar cell includes a back-side metallization at the back side." Neither reference teaches this limitation. Hartman does not teach a metallization at the back side--Hartman teaches that the back of the solar cell is defined by a substrate 15. Vilela teaches a structure that is contrary to Hartman's teaching that the back side of the solar cell is defined by the substrate 15. In Vilela's design, the back side is formed below the substrate 112. A person skilled in the art, who does not have the benefit of the present disclosure, would not know whether to put the substrate as the back side, as in Hartman, or the metallization as the back side, as in Vilela.

Claim 16 further recites in part: "an intra-unit electrical connection structure operable to electrically interconnect the solar cell and the by-pass diode in an electrical anti-parallel relation." Hartman has no such teaching of an "anti-parallel" interconnection at col. 4, lines 43-58 or elsewhere.

Claim 16 further recites in part: "a circuit electrical connection structure operable to electrically interconnect each of the solar cell unit structures in series." Although it discusses series interconnection, Harman certainly does not teach how solar cells may be interconnected in series with its other structure. Vilela has no teaching of interconnection.

Claims 16-18 are therefore not taught by the combination of teachings of the references.

Additionally, claim 17 recites in part: "the intermediate-structure projected area coverage on the heat sink is not less than the solar-cell projected area coverage on the heat sink." The explanation of the rejection relies on Figures 1-2 of Hartman. Figures 1-2 of Hartman do not even show the relevant features in the pertinent view. The plan view of Figure 1 does not show the solar cell 16 at all. As discussed in relation to the Ground 1 rejection of claim 1, one cannot tell about the projected area from a side view such as Figure 2 of Hartman, because it does not show the third dimension. In fact, one must look to Figure 3 of Hartman to see the relative projected areas. As shown in Figure 3, the projected area of the solar cells is much, much larger than the projected areas of the intermediate structure as identified by the Examiner.

Ground 4. Claims 9-10 and 19-20 are rejected under 35 USC 103 over Hartman '051 in view of Vilela '630 and Glenn '396. Applicant traverses this ground of rejection.

First requirement--there must be an objective basis for modifying or combining the teachings of the references.

Applicant incorporates the discussion of this requirement from the discussion of the Ground 2 and Ground 3 rejections.

Additionally, it is difficult to see any basis for combining the teachings of Glenn with those of Hartman. The use of the diode tape 10 of Hartman requires access to the back side of the solar cell, but the back side of the solar cell in the structure taught by Glenn is not accessible because of the other structure taught by Glenn, see for example the structure shown in Figure 1.

Second requirement--there must be an expectation of success.

Applicant incorporates the discussion of this requirement from the discussion of the Ground 2 and Ground 3 rejections.

The diode tape 10 of Hartman requires access to the back side of the solar cell, but the back side of the solar cell in the structure taught by Glenn is not accessible because of the other structure taught by Glenn, see for example the structure shown in Figure 1 of Glenn. Applicant can see no basis for an expectation of success in combining the teachings of Hartman and Glenn.

This requirement is not addressed at all in the explanation of the rejection.

Third requirement--the prior art must teach the claim limitations.

Claims 9 and 10 depend from claim 1, and incorporate its limitations. The limitations of claim 1 are not taught by these three references for the reasons stated in the responses to the Grounds 1-3 rejections, which are incorporated here.

Additionally, claim 9 recites, "the solar cell structure includes a joint between the intermediate structure and the heat sink, and wherein the joint comprises a metallic trace deposited upon a dielectric layer." The explanation of the rejection asserts that the elements 17 and 19 constitute the recited metallic trace, and that the bonding

element 18 constitutes the dielectric layer. The explanation of the rejection references Figure 1 and col. 5, lines 24-26 of Glenn. Neither of these locations suggests that the metal trace 19 and the conducting element 17 are deposited upon the dielectric 18.

Claim 10 recites "the joint comprises a PC board having a metal trace on a face thereof." The explanation of the rejection references Figure 1, and the same elements 17, 18, and 19 are discussed in relation to claim 9. There is no teaching that any of these elements is a PC (printed circuit) board. The explanation of the rejection asserts that "the structure of the joint is indistinguishable to a PC board having a metal trace on a face..." Applicant must respectfully disagree. A PC board is a specific structure. If the rejection is maintained, the Examiner must establish by evidence that the structure taught by Glenn is "indistinguishable" from a PC board.

Claims 19 and 20 depend from claim 16, and incorporate its limitations. The limitations of claim 1 are not taught by these three references for the reasons stated in the response to the Ground 3 rejections, which are incorporated here.

Additionally, claim 19 recites, "the solar cell structure includes a joint between the intermediate structure and the heat sink, and wherein the joint comprises a metallic trace deposited upon a dielectric layer." The explanation of the rejection asserts that the elements 17 and 19 constitute the recited metallic trace, and that the bonding element 18 constitutes the dielectric layer. The explanation of the rejection references Figure 1 and col. 5, lines 24-26 of Glenn. Neither of these locations suggests that the metal trace 19 and the conducting element 17 are deposited upon the dielectric 18.

Claim 20 recites "the joint comprises a PC board having a metal trace on a face thereof." The explanation of the rejection references Figure 1, and the same elements 17, 18, and 19 are discussed in relation to claim 9. There is no teaching that any of these elements is a PC (printed circuit) board. The explanation of the rejection asserts that "the structure of the joint is indistinguishable to a PC board having a metal trace on a face..." Applicant must respectfully disagree. A PC board is a specific structure. If the rejection is maintained, the Examiner must establish by evidence that the structure taught by Glenn is "indistinguishable" from a PC board.

Applicant asks that the Examiner reconsider and withdraw the rejections. Applicant requests allowance of the claims.

CONCLUSION

For at least the reasons set forth above, Applicant respectfully requests reconsideration of the Application and withdrawal of all outstanding objections and rejections. Applicant respectfully submits that the claims are not anticipated by, nor rendered obvious in view of the cited art either alone or in combination and thus, are in condition for allowance. Thus, Applicant requests allowance of all pending claims in a timely manner. If the Examiner believes that prosecution of this Application could be expedited by a telephone conference, the Examiner is encouraged to contact the Applicant's undersigned representative.

This Response has been filed within three (3) months of the mailing date of the Final Office Action and it is believed that no fees are due with the filing of this paper. In the event that Applicant is mistaken in these calculations, the Commissioner is hereby authorized to deduct any fees determined by the Patent Office to be due from the undersigned's Deposit Account No. 50-1059.

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